HBnB Evolution - Technical Documentation

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1. Introduction

HBnB Evolution is a simplified AirBnB-like platform connecting property owners with guests. Users can list properties, search for accommodations, and submit reviews.

Purpose: Blueprint for development team
Scope: Architecture, entities, API flows, design decisions

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2. High-Level Architecture

Three-Layer Design:

Presentation Layer

- **Components:** API endpoints (UserAPI, PlaceAPI, ReviewAPI, AmenityAPI)
- **Functions:** HTTP handling, validation, authentication, response formatting

Business Logic Layer

- **Components:** HbnbFacade (Facade Pattern), Domain Models
- **Functions:** Business rules, validation, entity coordination

Persistence Layer

- **Components:** Repositories, Database (PostgreSQL/MySQL)
- **Functions:** Data storage, CRUD operations, queries

Facade Pattern: Simplifies API → Business Logic interaction

- Without: API → Service → UserManager → PlaceManager → Repository
- With: API → Service → HbnbFacade → [Internal] → Repository

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3. Business Logic Layer

Core Entities

BaseEntity (Abstract)

- id: String (UUID4 format)
- created_at: DateTime
- updated_at: DateTime

User

- first_name, last_name, email, password_hash, is_admin: Boolean

- Rules: Unique email, hashed password, admin flag

Place

- title, description, price: Float, latitude: Float, longitude: Float, owner_id, amenity_ids
- Rules: Price > 0, valid coordinates, owner verification

Review

- rating: Integer, comment, user_id, place_id
- Rules: Rating 1-5, one review per user per place

Amenity

- name, description
- Rules: Unique names, admin-only management

Relationships

1. **User → Place** (1-to-many): One user owns many places
2. **User → Review** (1-to-many): One user writes many reviews
3. **Place → Review** (1-to-many): One place receives many reviews
4. **Place ↔ Amenity** (many-to-many): Places have multiple amenities

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4. API Interaction Flow

User Registration

Flow: Client → API → Service → Facade → User → Repository → Database
Key: Email uniqueness check, password hashing, UUID4 generation

Place Creation

Flow: Authenticated user → API → Facade → Place → Repository
Key: Owner verification, coordinate validation, amenity association

Review Submission

Flow: Authenticated user → API → Facade → Review → Repository
Key: Duplicate check, rating validation (1-5), user-place verification

Fetch Places List

Flow: Client → API → Facade → Repository → Database → Enrichment
Key: Filter processing, pagination, amenity data enrichment

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5. Design Decisions

1. **Three-Layer Architecture -** Separation of concerns, scalability
2. **Facade Pattern -** Simplified API layer, centralized coordination
3. **UUID4 IDs -** Global uniqueness, security, database independence

4. **Boolean Admin Flag** - Simple meets requirements, easy to extend
5. **Repository Pattern** - Database abstraction, testability
6. **Multi-level Validation** - Defense in depth, data integrity

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6. Implementation Guidelines

Phases

1. **Foundation:** BaseEntity, database schema, repositories
2. **Core Entities:** User, Place, Review, Amenity, Booking implementations
3. **Business Logic:** Facade, validation, transaction management
4. **API Layer:** Endpoints, authentication, error handling
5. **Testing:** Unit, integration, end-to-end tests

Security

- JWT authentication
- Password hashing (bcrypt)
- SQL injection prevention
- Input validation

Performance

- Database indexing
- Query optimization
- Caching strategies
- Pagination for large datasets

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7. Conclusion

Key Achievements:

- Clear three-layer architecture with Facade pattern
- Comprehensive domain model with business rules
- Well-defined API interaction patterns
- Scalable and maintainable design